

RadNet Security Seal Protocol

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RadNet Security Seal Protocol Thursday, February 19, 2004



RadNet Standard Header

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RadNet Message Header Format

The RadNet header contains the first 55 bytes of all RadNet messages. The header is intended to provide information regarding the operational status and location of an instrument. The header provides information regarding which instruments are (or are not) operating properly.

Field Name	Type	Position	Codes	Notes
Header Check Sum	Byte	1		The first byte (01, byte) is a checksum, to ensure the integrity of the header transmission. The checksum is the sum of bytes 2 through 55.
RadNet Version Number	Byte	2	See RadNet Versions Page	The second byte (02, byte) is the RadNet version number. It is used to indicate the version of the RadNet message. The receiving software is responsible for handling all received RadNet messages, although the most current version's functionality may not be provided.
Message Codes	Byte	3	See RadNet Message Codes Page	Byte (03) is the message code. The message code tells what type of RadNet message has been sent (status, check source, etc.).
Server Address	Word	4-5	None	Bytes (4-5) are the server address (1-64,536) of the pushing device. Since each instrument may perform as its own server, two bytes are used.
Monitor Address	Byte	6	None	Byte (6) is the address (1-256) of a specific monitor hooked up to a server. This protocol is intended to support existing (RS-485) systems. The practicality of hooking up more than 256 monitors to a single RadNet server is questionable.
Server Status	Byte	7	See RadNet Server Status Codes Page	Byte (7) is a code to display the status of the server. Codes are provided for normal as well as a variety of abnormal conditions.
Hardware Status	Byte	8	See Op/Hw Status Page Codes Page	Byte (8) is a code to display the overall Hardware Status of the instrument. Hardware status is intended to be a troubleshooting guide when responding to an abnormal condition. Instrument hardware malfunctions generally require repair work. Other conditions could be attributed to either hardware or operational problems. The instrument vendors are responsible for classifying conditions and prioritizing the status

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				change. The intention is that only the most critical status change be pushed; however a series of messages based upon a list of status changes could also be pushed. For example: If the instrument detected failures with low voltage, and low background, then the vendor could push each status in a separate message (at the abnormal push rate). These statuses could then be interpreted by the client as a HV power supply failure.
Operational Status	Byte	9	See Op/Hw Status Page Codes Page	Byte (9) is a code to display the overall Operational Status of the instrument. Operational status is intended to be a troubleshooting guide when responding to an abnormal condition. Instrument operational problems generally require response by health physics personnel. Other conditions can be attributed to either hardware or operational problems. The instrument vendors are responsible for classifying conditions and prioritizing the status change. The intention is that only the most critical status change be pushed; however a series of messages based upon a list of status changes could also be pushed. For example: If the instrument detected failures with low voltage, and low background, then the vendor could push each status in a separate message (at the abnormal push rate). These statuses could then be interpreted by the client as a HV power supply failure.
Location	Char[40]	10-49	None	Bytes (10-49) are for the location of the instrument. Location designations are highly individual, so no convention or specification is given. The location label must be left justified. Unused characters must be padded with space characters.
Authentication Byte Count Offset	Word	50-51		The length in bytes of the original message. If non-zero, indicates that authentication is in effect. If zero, then authentication is not implemented See the following web pages for more information: Background Information RadNet Implementation, Authentication, Encryption

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Authentication Status	Byte	52	See RadNet Authentication Status Codes Page	"Invalid" flag. This byte is always set to zero when the message is transmitted. Authentication services set this byte to a non-zero value if the message fails signature verification. Clients check this byte with zero meaning valid data and take appropriate "bad data" action if the byte is non-zero. See the following web pages for more information: Background Information RadNet Implementation , Authentication , Encryption
Reserved For Future Use	Byte	53	None	Byte (53) is reserved for future use and must be filled with zero values until specified by the protocol
Monitor Type	Word	54-55	See RadNet Monitor Type Codes Page	Bytes (54-55) are a code for the instrument type.

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Security Seal Body Format

The Security Seal (SS) body message has data conforming to generic Security Seal formats and provides real-time SS data. The SS body will tell you what type of Security Seal message you have received. The RadNet header contains the first 55 bytes of a RadNet message.

Field Name	Type	Position	Codes	Notes
R1	Float	56-59	N/A	Reserved for Future use
R2	Float	60-63	N/A	Reserved for Future use
Unique ID Preamble	Char [4]	C[1] = 64 C[2] = 65 C[3] = 66 C[4] = 67	N/A	<p>The Unique ID Preamble is used in conjunction with the Unique ID. By combining Unique ID Preamble and the Unique ID we obtain a totally unique ID for the message. This ID is used to connect different SS messages with each other and also allows two-database tables (RadNet messages) to be joined by a foreign key relationship.</p> <p>If another RadNet instrument is combined with a SS, then the SS will use the instrument Unique ID and Preamble ID for its messages. This use will allow the instrument reading and the SS reading to be joined together at the monitoring computer or within a database.</p> <p>When deploying a "smart" SS, it will look for packets from instruments within its area (using server and monitor address, or by IP address). When it sees a RadNet broadcast message, it will capture the Unique ID of the instrument, then it can create a SS message and ship its reading using the captured Unique ID.</p> <p>Another method is to have the instrument look for the SS packets and capture its Unique ID, then use the SS data for calculation. The instrument can send out the calculated readings onto the network using the SS information and could use its own Preamble ID and the SS's Unique ID.</p> <p>The goal here is to be able to combine the SS data with the instrument data and allow the end user to dictate how it would be implemented. How this is used would be defined by the needs of the end users. The SS may handle the task, or instrument on the network, or users may want the</p>

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				monitoring computers to combine the data.
Unique ID	Float	68-71	N/A	Date + Time + any other unique value (e.g.. mmddyyhhmmss + monitor address + server address = 1202970812970462). If multiple messages are sent, the Preamble ID+ Unique ID is used to match the multiple messages to one another as they are received by the client monitoring computer. See comments above..
Security Seal Message Type	Byte	72	See Security Seals Message Type Codes Page	This byte (72) is the SS Message Type Code and is intended to provide information about the type of message being pushed. This information will indicate if there is transactional (or other) data following this byte.

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Security Seal Status Message

The Security Seal (SS) Status Message is used to transmit the status of the security seal while it is collecting/analyzing the data or in standby mode. Because SS's maybe required to be in standby mode (on a shelf or control point) for long periods, the status message could be used to ensure the SS is still ready for use.

If the "Number of Messages" field is set to 0, then no data will be found past byte 74. However, if "Number of Messages" is set to a value grater then 0, the instrument has sent an ASCII text message that can be displayed or archived. If the message is less than 40 characters long, the instrument will pad the remaining space with space characters (Hex value = 20x or decimal value = 32). If the text is greater than 40 characters, then add another status message and increment the Number Of Messages field.

The SS is still required to set the Operational and Hardware Status codes within the RadNet Header. Upon any status change within the SS, the SS shall push a status message and/or security seal footer message.

When the SS has determined it has valid data, it shall push the data using the security seal footer message format. Then the SS should resume sending this status message at the normal/abnormal push rates.

The instrument manufacturer is responsible for deciding to implement the support of text messages, though it is not a requirement of the RadNet protocol. This option may or may not be implemented on all instrumentation.

The instrument manufacturers will define what messages to support and their content. Instrument manufacturers will define how many messages will be combined into 1 RadNet packet. Some instrument manufacturers may combine messages to reduce overhead and network traffic, while others will send only one status message per packet.

See Security Seals notes page for an example of the data stream format.

Here is an example of how this could be used:

Packet Number 1	Number Of Messages = 3	Message 0= 'Taking Background Reading' Message 1= 'Stabilizing detector' Message 2= 'Counting Sample'
Packet Number 2	Number Of Messages = 4	Message 0= 'Moving Sample' Message 1= 'Sample Placed' Message 2= 'Stabilizing The Detector' Message 3= 'Counting Sample'"
Packet Number 3	Number Of Messages = 1	Message 0= 'Count Complete, Analyzing Data'
Packet Number 4	Number Of Messages = 4	Message 0= 'Analysis complete' Message 1= 'Shipped Measurement' Message 2= 'Shipped Spectrum' Message 3= 'Standing By..'
Packet Number 5	Number Of Messages = 0	No extra status message sent, instrument using standard RadNet status messages to indicate the current state of the instrument.

Field Name	Type	Position	Codes	Notes
Number Of Messages	Word	73-74	N/A	Byte (73-74) is the number of repeating messages (frames) that are after this value If Number Of Messages = 0 then the client

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				software should ignore the remaining byte.
Status Message	Char[40]	C[1]=75 C[2]=76 C[3]=77 C[4]=78 C[5]=79 C[6]=80 C[7]=81 C[8]=82 C[9]=83 C[10]=84 C[11]=85 C[12]=86 C[13]=87 C[14]=88 C[15]=89 C[16]=90 C[17]=91 C[18]=92 C[19]=93 C[20]=94 C[21]=95 C[22]=96 C[23]=97 C[24]=98 C[25]=99 C[26]=100 C[27]=101 C[28]=102 C[29]=103 C[30]=104 C[31]=105 C[32]=106 C[33]=107 C[34]=108 C[35]=109 C[36]=110 C[37]=111 C[38]=112 C[39]=113 C[40]=114		If the "Number of Messages" field is set to 0, then no data will be found past byte 74. However, if "Number of Messages" is set to a value greater than 0, then the instrument has sent a ASCII text messages that can be displayed or archived. If the message is less than 40 characters long, then the instrument will pad the remaining space with space characters (Hex value = 20x or decimal value = 32). If the text is greater than 40 characters then add another status message and increment the Number Of Messages field.

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Security Seal Footer Format

The Security Seal Measurement (SSM) footer message has data conforming to generic SS formats. A RadNet header and Security Seal body must precede all footer messages. The header contains the first 55 bytes of a RadNet message; the SS body contains the next 17 bytes, for a total of 72 bytes preceding the footer.

Note: Red Field Names = Repeating Fields

Field Name	Type	Position	Codes	Notes
Seal Id	Char[16]	73-88	N/A	A unique ID of the seal, usually supplied by the seal itself.
Organization	Word	89-90	N/A	A unique ID of the Organization that owns the seal. In some cases this is done at manufacture so it can't be changed later.
Department	Byte	91	N/A	A unique ID of the department in the Organization that owns the seal.
Seal Group Identification	Char[4]	92-95	N/A	Some Seal Readers are limited in the number of seals they can communicate with at one time. This field allows reporting seals to be reported in groups small enough to be handled by a single reader. Its range is from 0 to 64000.
Number Of Stored Events	Word	96-97	N/A	Number of events received for the seal identified in Seal Id.
Life Counter	Word	98-99...n	N/A	The Life Counter is the number of times the seal may still be opened and closed.
Seal Stamp	Word	100-101...n	N/A	The seal stamp is generated each time the seal is initialized for a new use for trip.
Reading	Byte	102...n	N/A	This is the wire resistance value at initialization. It is used to determine if the seal has been tampered.
Units	Byte	103...n	0 = Resistance	See ? units. ?
Number Of Events	Byte	104...n	N/A	Number of events in footer. Maximum is 55.
Event Code	Byte	105...n	See Security Event Codes	Indicates what event is being reported.
Event Day	Byte	106...n	N/A	Byte (106) is day of the month.
Event Month	Byte	107...n	N/A	Byte (107) is month of the year.
Event Year	Word	108-109...n	N/A	Bytes (108-109) are the year. This is all four digits of the year (2002, etc.).
Event Hour	Byte	110...n	N/A	Byte (110) is hour of the day.
Event Minute	Byte	111...n	N/A	Byte (111) is the minute.
Event Seconds	Byte	112...n	N/A	Byte (112) is the second.

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Field Name	Type	Position	Codes	Notes
Reading Year	Word	113-114...n	N/A	Bytes (113-114) are the year. This is all four digits of the year (2002, etc.).
Reading Hour	Byte	115...n	N/A	Byte (115) is hour of the day.
Reading Minute	Byte	116...n	N/A	Byte (116) is the minute.
Reading Seconds	Byte	117...n	N/A	Byte (117) is the second.
Event Comments	Char[40]	118-157...n		
R1	Float	158-161...n	N/A	Reserved for future use.
R2	Float	162-165...n	N/A	Reserved for future use.
Number Of Alerts	Word	166-167...n	N/A	Number of alerts for this seal ID.
Alert Id	Byte	168...n	See Security Seals Action Codes	
Alert Day	Byte	169...n	N/A	Byte (169) is day of the month.
Alert Month	Byte	170...n	N/A	Byte (170) is month of the year.
Alert Year	Word	171-172...n	N/A	Bytes (171-172) are the year. This is all four digits of the year (2002, etc.).
Alert Hour	Byte	173...n	N/A	Byte (173) is hour of the day.
Alert Minutes	Byte	174...n	N/A	Byte (174) is the minute.
Alert Seconds	Byte	175...n	N/A	Byte (175) is the second.
Comments	Char[16]	176-191...n		
R1	Float	192-195...n	N/A	Reserved for future use.
R2	Float	196-199...n	N/A	Reserved for future use.

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Security Seals Notes/Comments

If Security Seals Message = 0 then see Security Seals Footer Page. The Portable Instrument Measurement Footer is pushed whenever there are any status changes or an abnormal push frequency. This footer is optional and is not needed if no additional channel data is supplied.

If Security Seals Message = 1 then see Security Seals Status Message Footer Page. This setting should be instrument configurable (turn on/off RadNet Status shipping). When status shipping is turned on, the Security Seals Status Footer is shipped whenever the instrument is ideal or no status change has occurred with the instrument. When the instrument has valid data or upon a status change, it will push data using the Security Seals Measurement. This message is not intended to be the only message being shipped by the instrument.

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Example of Security Seal Status Message Format:

RadNet Field	Start Byte Position	End Byte Position	Notes
RadNet Header	1	55	
Security Seals Body	56	72	
Start Of Status Message Footer			
Number of Messages	73	73	Number of Messages=4
Start Of Messages Repeating Frame Data			
Status Message 0	74	113	Status Message 0 Value= 'Moving Sample'
End of Status Message 1 Data			
Status Message 1	114	153	Status Message 1 Value = 'Sample Placed'
End of Status Message 1 Data			
Status Message 2	154	193	Status Message 2 Value= 'Stabilizing The Detector'
End of Status Message 1 Data			
End Of Messages Repeating Frame Data			
End Of Status Message Footer			

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Example of Security Seal Message Format:

RadNet Field	Start Byte Position	End Byte Position	Notes
Start Of RadNet Header			
Header Check Sum	1	1	
RadNet Version Number	2	2	Value = 0
Message Code	3	3	Value = 0
Server Address	4	5	Value = 12345
Monitor Address	6	6	Value = 244
Server Status	7	7	Value = 0, Normal
Hardware Status	8	8	Value = 0, Normal
Operational Status	9	9	Value = 0, Normal
Location	10	49	Value = "Container 1736-3748***..." * = ASCII Code 32
Authentication Byte Count Offset	50	51	Value = 1000, message has authentication data starting at byte 1000 and going to the end of message packet.
Authentication Status	52	52	Value = 0, message authenticated.
R1	53	53	Value = 0
Monitor Type	54	55	Value = 21, security seal
End Of RadNet Header			
Start Of Security Seal Body			
R1	56	59	Value = 0
R2	60	63	Value = 0
Unique Id Preamble	64	67	Value=Aqe%
Unique Id	68	71	Value = 120302152115678
Security Seal Message Type	72	72	Value = 0, Seal Message

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End Of Security Seal Body

Start Of Security Seal Footer

Seal Id	73	88	Value = "1234-%788~23"**... * = ASCII Code 32
Organization	89	90	Value = 27467
Department	91	91	Value = 236
Seal Group identification	92	95	Value = "e&kk"
Number Of Stored Events (NOSE)	96	97	Value = 2

Start Of NOSE Repeating Frames

Life Counter	98	99	Value = 11
Seal Stamp	100	101	Value = 101
Reading	102	102	Value = 3
Units	103	103	Value = 36, electrical resistance

End of NOSE 1 Data

Life Counter	104	105	Value = 12
Seal Stamp	106	107	Value = 109
Reading	108	108	Value = 4
Units	109	109	Value = 36, electrical resistance

End of NOSE 2 Data

End Of NOSE Repeating Frames

Number Of Events (NOE)	110	110	Value = 2
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Start Of NOE Repeating Frames

Event Code	111	111	Value = 0, Seal_Set
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Event Day	112	112	Value =23
Event Month	113	113	Value =11
Event Year	114	115	Value = 2003
Event Hour	116	116	Value = 23
Event Minutes	117	117	Value = 58
Event Seconds	118	118	Value = 12
Event Comments	119	158	Value = “*****...” * = ASCII Code 32
R1	159	162	Value = 0, Reserved For Future Use
R2	163	166	Value = 0, Reserved For Future Use

End Of NOE 1

Event Code	167	167	Value =2, Seal_Open
Event Day	168	168	Value =23
Event Month	169	169	Value =11
Event Year	170	171	Value = 2003
Event Hour	172	172	Value = 23
Event Minutes	173	173	Value =58
Event Seconds	174	174	Value =17
Event Comments	175	214	Value = “*****...” * = ASCII Code 32
R1	215	218	Value = 0, Reserved For Future Use
R2	219	212	Value = 0, Reserved For Future Use

End Of NOE 2

End Of NOE Repeating Frames

Number Of Alerts (NOA)	213	214	Value = 2
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Start Of NOA Repeating Frames

Alert Id	215	215	Value = 1, Seal_Alert_MSG
Alert Day	216	216	Value =23
Alert Month	217	217	Value =11
Alert Year	218	219	Value = 2003

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Alert Hour	220	220	Value = 23
Alert Minutes	221	221	Value = 58
Alert Seconds	222	222	Value = 12
Alert Comments	223	238	Value = "*****..." * = ASCII Code 32
R1	239	242	Value = 0, Reserved For Future Use
R2	243	246	Value = 0, Reserved For Future Use

End Of NOA 1

Alert Id	247	247	Value = 1, Seal_Alert_MSG
Alert Day	248	248	Value = 23
Alert Month	249	249	Value = 11
Alert Year	250	251	Value = 2003
Alert Hour	252	252	Value = 23
Alert Minutes	253	253	Value = 58
Alert Seconds	254	254	Value = 17
Alert Comments	255	270	Value = "*****..." * = ASCII Code 32
R1	271	274	Value = 0, Reserved For Future Use
R2	275	278	Value = 0, Reserved For Future Use

End Of NOA 2

End Of NOA Repeating Frames

End Of Security Seal Footer

Start Of Authentication Data Stream

Authentication Data	1000	1500	Value = any byte values
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End Of Authentication Data Stream

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Security Seals Specific Codes

Security Event Codes

Seal Event codes describe the events that can occur while the seal is in monitoring mode.

Code	Meaning	Notes
0	SEAL_SET	The seal has been initialized and all previous events cleared.
1	SEAL_TAMPER	The seal has been opened or the electrical characteristics (resistance) have changed since the seal was set.
2	SEAL_OPEN	The seal has been opened and is still open.
3	SEAL_CLOSED	The seal is closed.
4	SEAL_LOWBATT	The seal battery is low.
5	SEAL_RTC_STOPPED	The seal clock has stopped.
6	SEAL_TIMECHANGE	The seal time has changed since the seal was set.

Security Seals Action Codes

Seals can have multiple modes of reporting events. The Security Seal Action codes indicate the mode or kind of message being pushed. They can also be looked at as message priority indicators.

Code	Meaning	Notes
0	SEAL_NONALERT_MSG	Indicates a message that was collected in a verify or timed manner (non real-time).
1	SEAL_ALERT_MSG	Indicates a real-time alert transmitted by the seal as the event is occurring.

Security Seals Message Type Codes

Security Seals Message Type Codes indicates the type of Security Seal message being pushed.

Code	Meaning	Notes
0	Measurement Message	
1	Status Message	

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Standard RadNet Header Codes

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Authentication Status Codes

See the following pages for more information concerning RadNet Security Implementation:

Background Information

RadNet Security Implementation

Authentication

Encryption

These codes indicate whether a RadNet message has been authenticated (message fails signature verification). RadNet message(s) are directed to/at a RadNet Authentication Server (RAS) or other device. The RAS will authenticate the message and set byte 52 to indicate the status of the authentication process. The RAS server will then forward the message to clients on the network. It is important that the RAS server is secure and that the data leaving the RAS server is on a secure network (the message will not be tampered with after authenticated). It is also important to note that the RAS server does not strip the authentication keys from the message, and the authentication process could be done at any time, including storing the authentication signature within a database for future verification of the message.

The Authentication software/server will set this byte value to indicated message signature verification status.

Code	Meaning	Notes
0	Message is Ok	
>0	Message fails signature verification.	

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RadNet Channel Types

Below is a code for type of channel.

Code	Meaning	Notes
0	Alpha	
1	Beta	
2	Gamma	
3	Neutron	
4	Iodine	
5	Noble Gas	
6	Tritium	
7	Stack Flow	
8	Sample Flow	
9	Temperature	
10	Sample Pressure	
11	Leak rate	Primary to secondary, or containment building leak
12	Reactor power	Used for leak measurements
13	Beta + Gamma	The sum of the beta and gamma channels.
14	Latitude	
15	Longitude	
16	Altitude	
17	Humidity	
18	Wind Speed	
19	Wind Direction	
20	Alpha/Beta	
21	Pulse Height Analysis (PHA)	
22	Dust Particle	
23	Humidity	
24	Anemometer	

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RadNet Monitor Type Codes

Bytes (54-55) are code for the instrument type.

Code	Meaning	Notes
0	Gamma Area Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
1	Gamma Crit Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
2	Neutron Area Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
3	Neutron Crit Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
4	Alpha CAM	Uses the Alpha CAM body, Measurement Footer, Spectrum Footer. See Alpha CAM Header, Body, Measurement Footer, Spectrum Footer and Notes for more information.
5	Beta CAM	Uses the Beta Cam body and footer format. See Beta CAM Header, Body, Footer and Notes for more information.
6	PCM Monitor	Uses the PCM body and footer format. See PCM Header, Body, Footer and Notes for more information.
7	PCM Portal Monitor	Uses the PCM Body and Footer format. See Portal Header, Body, Footer and Notes for more information.
8	PING	Uses the PING Body and Footer format. See PING Header, Body, Footer and Notes for more information.
9	Glove Box Monitor/Hand Monitor	Uses The PCM Body and Footer format. See PCM Header, Body, Footer and Notes for more information.

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10	Hand And Foot Monitor	Uses The PCM Body and Footer format. See Hand and Foot Header, Body, Footer and Notes for more information.
11	Generic Sensor	Uses The Generic Sensor Body and Footer format. See Generic Sensor Header, Body, Footer and Notes for more information.
12	Electronic Reading Dissymmetry	See Header, ERD Body, ERD Footer, for more information.
13	Item Contamination Monitor (ICM)	Uses The ICM Body and Footer format. See Header, Body, Footer and Notes for more information.
14	Radiation Gateway Monitor	Uses The Radiation Gateway Body and Footer format. See Header, Body, Footer and Notes for more information.
15	Gamma Spectrum	Uses The Gamma Spectrum Body, Measurement, Spectrum, Status and Footer format. See Header, Body, Measurement, Spectrum, Status and Notes for more information.
16	Portable Instruments	Protocol Pending, in development by vendor
17	Meteorology Tower	Uses The Meteorology Tower Body and Footer format. See Header, Body, Measurement, Status, and Notes for more information.
18	Video	Uses The Video Body, Status and Footer format. See Header, Body, Footer, Status and Notes for more information.
19	Image	Protocol Pending, in development by vendor
20	Audio	Protocol Pending, in development by vendor
21	Security data tag/seal	Protocol Pending, in development by vendor
22	Tritium Air Monitor	Protocol Pending, in development by vendor
23	Dust Particle Monitor	Protocol Pending, in development by vendor

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RadNet Message Codes

Byte (03) is the message code. The message code indicates what type of RadNet message has been sent (status, check source, etc.).

Code	Meaning	Notes
0	Normal/Standard RadNet Message	Message is pushed by the instrument and received by the clients.
1	Alarm Ack	Message is pushed by the clients and received by the instruments. See Alarm Acknowledge Alarm Msg. Notes and Alarm Acknowledge Header Format
2	Pass Through	Message is pushed by the instrument and received by the client or can be pushed by the client and received by the instrument. This method can be used for bi-directional communication by the clients and instruments. See Pass Through Msg. Header Notes / Pass Through Header Format or Pass Through Codes
3	Check Source	Message is pushed by the clients and received by the instruments. See Check Source Msg. Notes and Check Source Header Format
4	Diagnostic/Self-Check	Message is pushed by the clients and received by the instruments. See Diagnostic/Self-Check Msg. Notes and Diagnostic/Self-Check Header Format
5	Request Data	A client/server sends this request to an instrument. In response to this request the instrument will send its current information (Normal RadNet Message). See Request Data Notes and Request Data Header Format
6	Update/Request Date/Time	A client/server sends this request to an instrument. In response to this request the instrument will send/set the date/time. See Update/Request Date/Time Notes and Update/Request Date/Time Header Format
7	Acknowledge Receipt	This message is used by the monitoring computer to acknowledge receipt of data from an instrument. See Acknowledge Receipt Message Header Format and Acknowledge Receipt Message Notes for more information.
255 (FFh)	Encrypted RadNet Message	See the following pages for more information: Background Information RadNet Implementation Encryption Header Message Format

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	Encryption Background Information
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RadNet Operational and Hardware Status Codes

Note: It is the responsibility of the instrument manufacturer to prioritize the operational and hardware status for the instrument. Any status code can be used either as an operational or hardware status code base upon the instrument usage or needs.

Below is a code used to display the Hardware/Operational Status of the instrument. Hardware status is intended to be a troubleshooting guide when responding to an abnormal condition. Instrument hardware malfunctions generally require repair work. Other conditions may be attributed to either hardware or operational problems. Instrument vendors are responsible for classifying conditions and prioritizing the status change. The intention is that only the most critical status change be pushed; however a series of messages based upon a list of status changes could also be pushed. For example: If the instrument detected failures with low voltage and low background, the vendor could push each status in a separate message (at the abnormal push rate). These statuses could then be interpreted by the client as an HV power supply failure.

OP = Guide For Operational Status Use

HW = Guide For Hardware Status Use

Code	Meaning	OP	HW	Notes
0	Normal	Y	Y	
1	High Alarm	Y	N	
2	HV Fail	N	Y	
3	Count Fail	Y	N	
4	Bkg Fail	Y	N	
5	Bkg Update	Y	N	
6	Comm Fail	N	Y	
7	Gas Empty	Y	N	
8	Buffer Full	Y	Y	
9	Acked High Alarm	Y	N	
10	Flow Fail Low	Y	Y	
11	Flow Fail High	Y	Y	
12	Filter Door Open	Y	N	
13	Instrument Not Ready	Y	Y	
14	Instrument In Calibration Mode	Y	Y	
15	Fast Concentration Alarm	Y	N	
16	Slow Concentration Alarm	Y	N	
17	DAC Hours Alarm	Y	N	
18	Count Rate Alarm	Y	Y	
19	Release Rate Alarm	Y	N	

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20	Fast Concentration Alarm Disabled	Y	N	
21	Slow Concentration Alarm Disabled	Y	N	
22	Count Rate Alarm Disabled	Y	N	
23	Check Source Mode	Y	N	
24	Out Of Service	Y	Y	
25	Alert Alarm	Y	N	
26	Trend Alarm	Y	N	
27	Not Initialized	Y	Y	
28	Standby	Y	Y	
29	Local Control	Y	Y	
30	Flush	Y	N	
31	Alarm Disabled	Y	N	
32	External Fail	Y	Y	
33	AC Off	Y	Y	
34	Crit Relay Fail	Y	Y	
35	Out Of Limits	Y	Y	
36	Crit Alarm	Y	N	
37	NV RAM Fail	N	Y	When the instrument's non-volatile RAM cannot be read/written.
38	Check Source Results	N	Y	Indicates that the message with this status carries check source results. This indicates that this message contains the final check source result at the completion of the check source integration. Prior to this code being sent the status code would be 23 (<i>Check Source Mode</i>).
39	Audio Failure	N	Y	Indicates that the instrument has a problem with its audio circuit.
40	Over Range	Y	Y	Indicates that the instrument has exceeded an Over Range value.
41	Diagnostic/Self-check completed, Passed self-check	Y	Y	Indicates that the instrument has performed an Internal Diagnostic/Self-check and found no error conditions. See Diagnostic/Self-Check Msg. Notes and Diagnostic/Self-Check Header Format

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42	Diagnostic/Self-check completed, Failed self-check	Y	Y	Indicates that the instrument has performed an Internal Diagnostic/Self-check and found error conditions. See Diagnostic/Self-Check Msg. Notes and Diagnostic/Self-Check Header Format
43	High/High Alarm	Y	N	Third alarm level used in many plants.
44	Internal stabilization failure	Y	N	From automatic energy stabilization.
45	Parameter error	Y	N	Bad setup.
46	Temperature failure	N	Y	Temperature out of operational range.
47	Power supply failure	N	Y	From power supply, or from voltage reading.
48	Analog input failure	N	Y	4-20 mA analog input failure (0 mA for example).
49	Filter failure	N	Y	Automatic filter advance failure (motor, end of roll...).
50	Detector cable failure	N	Y	
51	Electronic or Acquisition board failure	N	Y	Electronic failure.
52	Low Battery	N	Y	Backup battery or internal battery has a low voltage condition.
53	Battery Failed	N	Y	Backup battery or internal battery has failed.
54	Clock Failed	N	Y	Internal clock has failed.
55	User defined	Y	Y	This error code is used whenever an instrument supports user defined error codes. It is used whenever there is a desire to inform a user that one of their error conditions has been reached. Since there is no way of knowing what is contained in the error code logic, this generic response should be used to indicate the error.
56	Internal Communication Failure	N	Y	

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RadNet Versions

Note: The last approved version in this list is the current version in use by RadNet.

The second byte (02, byte) is the RadNet version number. This number is used to indicate the version of RadNet be pushed by the server. It is the responsibility of the receiving software to handle all received RadNet messages, although the most current version's functionality may not be provided.

Version	Date Approved	Notes
0	Approved	

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RadNet Units Codes

Below is a code for the RadNet units of the reading.

Code	Meaning	Notes
0	cps	
1	Rem/hr	
2	R/hr	
3	Sv/hr	
4	Bq/cm3	
5	Bq	
6	Degrees Centigrade (C)	Temperature Unit
7	Pascal (Pa)	Pressure Unit
8	cc	Flow Volume Unit
9	cc/sec	Flow Rate Unit
10	cps/cc	Activity Unit
11	counts	Counting Events Unit
12	cm/sec	Velocity Unit
13	bqMeV/cc	Gamma Gas Activity
14	degrees	Wind Direction (180 = south)
15	Gy/hr	Dose Rate Unit
16	RPU%	Reactor Power Unit
17	Kg/sec	Masse flow rate
18	n/cm2	Neutrons / cm2
19	n/cm3	Neutrons / cm3
20	DAC	Derived Air Concentration
21	bq/m3	Becquerel per cubic meter
22	bq/kg	Becquerel per kilogram
23	Latitude	
24	Longitude	
25	Mu_Hemin	Hemisphere North
26	Mu_Hemis	Hemisphere South
27	Mu_Hemie	Hemisphere East
28	Mu_Hemiw	Hemisphere West
29	Mu_Knots	Wind Speed (knots)
30	Mu_KPH	Wind Speed (knots per hour)
31	Mu_MPS	Wind Speed (meters per second)
32	Mu MPH	Wind Speed (meters per hour)

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33	Mu_METERS	Altitude (meters)
34	Mu_Feet	Altitude (feet)
35	Mu_Percent	Humidity
36	Resistance	Electrical Resistance
37	um	Micro-meter

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RadNet Server Status Codes

Byte (7) is a code that displays the status of the server. Codes are provided for normal as well as a variety of abnormal conditions. See Appendix A for Server Status message codes.

Code	Meaning	Notes
0	Normal Operation	
1	Instrument Communication Error	
2	TCP Communication Error	
3	UDP Communication Error	
4	Hard Disk Full	
5	Password Fail	
6	Starting Up	
7	Shutting Down	
8	Program Error	
9	NetWork Access Granted	
10	NetWork Access Denied	